



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/802,428	03/17/2004	Bin Zhang	200314385-1	3515
22879 7590 08/20/2009 HEWLETT-PACKARD COMPANY Intellectual Property Administration 3404 E. Harmony Road Mail Stop 35 FORT COLLINS, CO 80528			EXAMINER WERNER, DAVID N	
			ART UNIT 2621	PAPER NUMBER
			NOTIFICATION DATE 08/20/2009	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

JERRY.SHORMA@HP.COM  
ipa.mail@hp.com  
jessica.l.fusek@hp.com

### Office Action Summary

**Application No.**

10/802,428

**Applicant(s)**

ZHANG ET AL.

**Examiner**

David N. Werner

**Art Unit**

2621

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 May 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3, 5, 7-15, 17, 19-25, 27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 7-15, 17, 19-25 and 27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This Office action for U.S. Patent Application 10/802,428 is responsive to communications filed 04 May 2009, in reply to the Non-Final Rejection of 04 February 2009. Currently, Claims 1–3, 5, 7–15, 17, 19–25, and 27 are pending.
2. In the previous Office action, Claims 1–3, 5–12, and 25 were rejected under 35 U.S.C. 101 as non-statutory. Claims 1–3, 5–7, 10–15, 17–19, and 22–25 were rejected under 35 U.S.C. 103(a) as obvious over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments" (de Smet et al.) in view of "K-Harmonic Means—A Data Clustering Algorithm" (Zhang et al.). Claims 8, 9, 20, and 21 were rejected under 35 U.S.C. 103(a) as obvious over de Smet et al. in view of Zhang et al. and in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation (Herrmann et al.). Claims 27 and 29 were rejected under 35 U.S.C. 103(a) as obvious over de Smet et al. in view of Zhang et al. and in view of U.S. Patent 6,084,912 A (Reitmeier et al.).

### ***Response to Amendment***

3. Applicant's amendments to the specification have been fully considered. The rejection of Claims 1–3, 5, and 7–12 under 35 U.S.C. 101 is withdrawn.
4. Applicant's amendments to the claims have been fully considered. The rejection of Claim 25 under 35 U.S.C. 101 is withdrawn.

***Response to Arguments***

5. Applicant's arguments filed with respect to claim 1 have been fully considered but they are not persuasive. Applicant states that the de Smet and Zhang references do not disclose the claimed limitations of recalculating K regression functions or stopping the repeated algorithm according to "membership probabilities".

Regarding the alleged deficiency of the references to show calculating the K regression function based on the membership probability, it is noted that in the Final Rejection of 29 May 2008, the probability function was explicitly mapped with the function  $q(i,k)$  in the Zhang reference (pg. 4). Each of the previous three Office actions made reference to "membership probability  $q(i,k)$ " in discussing Zhang et al. Applicant has not provided any evidence to the contrary, in support of the conclusory statements in page 11 of the arguments that "there is nothing in...the KHM clustering described in Zhang" to recalculate the K regression functions based on membership probabilities. Applicant is reminded that once a *prima facie* case of patentability has been established, the burden shifts to applicant to come forward with rebuttal evidence or arguments to overcome the *prima facie* case. *In re Bell*, 991 F.2d 781, 783-784, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993); *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956; (Fed. Cir. 1993); *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

Next, assuming that  $q(i,k)$  in Zhang et al. is a calculation of probability of membership for each data point, it must be shown that this calculation is used "to recalculate regression functions", and that this recalculation stops if changes in

membership probabilities or changes in the K-regression function satisfy a stopping criterion.

As previously stated in page 5 of the Non-Final Rejection of 04 February 2009, in Zhang et al.,  $m(k)$  is a regression function according to the normal definition of the term. The calculation of the center point is performed for K center points (Zhang, pg. 4: "the center positions,  $m(k)$ ,  $k=1, \dots, K$ "), so certainly the calculation of  $m(k)$  for each of these center points is a process of calculating "K regression functions". The description of  $m(k)$  in Zhang et al. shows it as a "recursive formula" in which after the initial positions are calculated, "the new positions of the centers are calculated" (pg. 5). Since  $m(k)$  incorporates  $q(i,k)$ , the recalculation of  $m(k)$  at each iteration is "at least based on"  $q(i,k)$ .

In addition, the recursion in Zhang is described as continuing "until the performance value stabilizes". Here, "stabilize" is assumed to have its ordinary definition of being held to a steady state, or constant. This stabilization is shown graphically in pages 15, 18, 21, and 24, in which the positions of the center points only change minimally after enough iterations. Then, this convergence of the center points satisfies the test of "determining whether changes in the K regression function satisfy a stopping criterion", one of the two-pronged test given in claim 1.

Considering this, all rejections of the claims over the prior art are maintained.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments" (de Smet et al.) in view of "K-Harmonic Means–A Data Clustering Algorithm" (Zhang et al.). De Smet et al. discloses using an iterative segment-merging technique to determine information for an image (abstract).

Regarding claims 1, 13, and 25, in de Smet et al., an initial motion field is first determined with a block-matching technique on 4 x 4 blocks (§ 2.1). These initial block motion vectors are used for the initial segmentation (§ 2.3). Then, the step of performing the block-based motion estimation is the claimed step of "providing data points". Next, the segments are iteratively merged according to similar or shared motion, according to the K-means clustering algorithm (§ 2.3). This is the claimed step of "clustering the data points". When this process is finished, the result is a series of large segments corresponding to distinct moving regions of an image, each with an associated motion vector (§ 2.3). This is the claimed step of "providing motion estimation". However, the present invention specifies performing regression clustering according to a K-Harmonic Means function, which is not the same as the K-means function of de Smet et al.

Zhang et al. discloses the K-Harmonic Means data clustering algorithm. Regarding claim 1, 3, and 25, Zhang et al. teaches selecting K centers  $m(l)$  from N data points  $x(i)$  (pg. 1), initializing center points (pg. 2) and performing an initial iteration (pg. 5), calculating distance  $d(i,l)$  between data point  $x(i)$  and center point  $m(l)$  (pg. 4), calculating membership probability  $q(i,k)$  and weighting function  $p(i,k)$  (pg. 5), recursively calculating new  $m(k)$ , (pg. 5), and stopping when the recursively-calculated performance value stabilizes, that is, when its change with each iteration becomes small (pg. 5). Then, the K calculations of centers  $m(l)$  are the claimed "regression functions" for performing regression clustering according to the K-harmonic means function. The calculation of each iteration of the recursive function is the claimed recalculation based on the membership probability, as  $m(k)$  is dependent on probability function  $q(i,k)$ . The stabilization is the claimed "stopping criterion".

De Smet et al. discloses the claimed invention, except for using K-Harmonic Means function to perform regression clustering. Zhang et al. teaches that it was known to perform data clustering with the K-Harmonic means function. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to perform clustering based on a K-Harmonic means function, as taught by Zhang et al., rather than a linear function such as the K-means function of de Smet et al., since Zhang et al. states in the abstract that K-harmonic clustering is less sensitive to detrimental effects from sub-optimal initialization than conventional clustering techniques. Additionally, the K-harmonic means function was specifically designed as an improved version of the K-means function, which "significantly improves the quality

of clustering results" compared with K-means (abstract). Then, the de Smet et al. algorithm contains a basic method which the present invention is an improvement thereof. The prior art Zhang et al. describes a known technique, the K-Harmonic means clustering algorithm, applicable to the base segmentation method of de Smet et al., by substituting it for the K-means algorithm. Then, one having ordinary skill in the art would have recognized that applying the K-harmonic means algorithm of Zhang et al. to de Smet et al. would have yielded the predictable result of "significantly [improved] quality of clustering results" and resulted in an improved system. Therefore, it is respectfully submitted that the use of K-harmonic clustering in de Smet et al. is considered obvious, since it has been held that applying a known technique to a known method ready for improvement to yield predictable results involves only routine skill in the art. *Dann v. Johnston*, 425 U.S. 219, 230, 189 USPQ 257, 261 (1976); *In re Nilsen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988).

Regarding claims 2, 3, 14, and 15, as previously mentioned, de Smet et al. produces a motion vector for each segment in an image (§ 2.3). As a result, the most important moving areas are determined (§ 3). Regarding claims 10 and 22, in de Smet et al., pixels are set as (x,y,t) triples, with x and y as spatial coordinates and t as a time coordinate (§ 2.2).

Regarding claims 11 and 23, de Smet et al. illustrates motion fields (figures 3-6). Although these motion fields are not shown as overlaid on the images, the examiner takes Official Notice that it was well-known in the art at the time of the invention to



display a motion field superimposed on an image to provide a visual representation of motion vectors.

Regarding claims 12 and 24, de Smet et al. illustrates highlighted motion segments overlaid on an image (figures 11 and 12).

Regarding claims 5 and 17, in Zhang et al., a clustering in which initialization is randomized is described (pg. 11).

Regarding claims 7 and 19, insensitivity to initialization is an inherent result of the K-Harmonic means algorithm (abstract).

8. Claims 8, 9, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over de Smet et al. in view of Zhang et al. as applied to claims 1 and 13 above, and further in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation" (Herrmann et al.). Claims 8, 9, 20, and 21 disclose using color information to segment images, but de Smet et al. only discloses "standard watershed techniques" (§ 2.2) to perform the initial segmentation without providing details.

Herrmann et al. discloses a method for image segmentation to extract objects from a moving image. Regarding claims 8, 9, 20, and 21, after an initial block-matching motion estimation, similar to de Smet et al., images are segmented according to specific color information, followed by shape analysis, and lastly motion analysis to merge regions to determine objects (§ II). This color, shape, and motion information form the claimed "predetermined criteria". In color analysis, a region is determined as

homogeneous if the pixel difference in the region is below a threshold. Homogenous, connected areas are determined as "quasi-flat zones". These quasi-flat zones are further processed and become the basis for further segmentation (§ II.B). Then, the color analysis is the claimed step of "portioning data according to color".

De Smet et al., in combination with Zhang et al., disclose a majority of the features of claims 8, 9, 20, and 21 as discussed above, the claimed invention except for color segmentation. Herrmann et al. teaches that it was known to segment a moving image according to color. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine image segmentation by color as taught by Herrmann et al., since Herrmann et al. teaches in page 205, third paragraph, that color analysis produces the most accurate type of segmentation.

9. Claims 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over de Smet et al. in view of Zhang et al., and in view of US Patent 6,084,912 A (Reitmeier et al.) Claim 27 is in means-plus-function format, complying with 35 U.S.C. 112, sixth paragraph. Accordingly, the "system" of claim 27 will be limited to a general-purpose computer such as a PC, as illustrated in figure 5 of the specification of the present invention. Although it is implied that the algorithms of de Smet et al. and Zhang et al. are computer-operated, neither de Smet et al. nor Zhang et al. explicitly teach this.

Reitmeier et al. discloses a video encoder. This encoder may operate on MPEG-4 video (column 1: line 57), as specified in paragraphs [0006] and [0007] of the present invention as a codec on which the present invention is applied. Regarding

claim 27, the encoder of Reitmeier et al. may operate as a software application on a general-purpose computer (column 2: lines 64-67).

De Smet et al., combined with Zhang et al., discloses the claimed invention except for encoding video on a general-purpose computer. Reitmeier et al. teaches that it was known to implement an MPEG-4 encoder as software embedded on a computer. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to encode the system of de Smet et al. and Zhang et al. in a software MPEG encoder embedded on a computer, as taught by Reitmeier et al., in order to perform computationally complex functions such as motion compensation, quantization, and variable-length encoding inherent in the video coding process.

### ***Conclusion***

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. N. W./  
Examiner, Art Unit 2621

/Dave Czekaj/  
Primary Examiner, Art Unit 2621